

# MENG 284: Robotics & Automation

## Winter 2020

### Course Outline

Instructor: Mr. Imtehaze Heerah, BEng. (Hons), MASc.

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Lectures: M (14.30 – 15.20) & Tu (8.30 – 10.20) in TEC 181

Labs (TEC 135): **X01A** – W (9.30 – 11.20); **X01B** – F (9.30 – 11.20)  
**X01C** – Th (13.30 – 15.20)

Office Hours: M (13.30 – 14.20), Tu (10.30 – 11.20)

**Course Description:** Students will be introduced to the concepts of automation, as they apply to production plants and assembly processes. Sensors, controllers, actuators, materials, power-transmission systems, computer hardware and computer software will be examined. Basic principles of robotics will be considered.

**Offered:** Academic Term 4 (Winter)

**Credit:** 3

**In-class workload:** 3 hrs Lecture, 2 hrs Lab

**Out-of-class workload:** 5 hrs

**Prerequisites:** ECET 149, MENG 283

#### COURSE OBJECTIVES:

1. Identify robotic and automation applications
2. Classification of industrial robots
3. Identify common robotic and automated systems components such as actuators, power transmission systems, sensors and grippers
4. Create control programs for a 5-axis robot
5. Mathematically analyze planar & simple spatial robotic systems for position control
6. Understand and know when to use fixed, programmable and flexible automation systems including computer integrated manufacturing (CIM) and automated work cells
7. Identify automation support systems including: materials handling, storage & retrieval, inspection & testing, identification & tracking

#### COURSE OUTLINE:

1. Introduction to Robotics and Robotic Applications
2. Industrial Robots Classification – Kinematic Structure, Work envelope, Control System & Actuation
3. Robot Kinematic Design
4. Electric Actuators & Control Techniques - DC Motors, Stepper Motors
  - a. Speed Control (PWM, Dynamic Braking & Plugging)

- b. Direction control using H-bridges
- 5. Robot Transmission Components - Conventional components, Ballscrew assemblies, Harmonic Drives
- 6. Sensors
  - a. Sensor Characteristics & Construction
  - b. Position Sensors (Resistive, Capacitive, Inductive & Optical)
    - Potentiometers, LVDT, Eddy Currents sensors, Hall effect sensors, Ultrasonic sensors, Infrared sensors, Encoders (Absolute & Incremental)
  - c. Velocity & Acceleration Sensors
  - d. Force & Tactile Sensors
  - e. Vision systems
- 7. Robot controllers & programming
- 8. Kinematic analysis of Planar & SCARA Robots
  - a. Position analysis
  - b. Robot resolution
  - c. Velocity analysis
- 9. Introduction to Automation – Fixed & Flexible Automation; Automated Workcells - Materials Handling, Storage, Assembly, Inspection & Testing and Identification & Tracking

**TEXTBOOKS:**

No textbook is required for this course. All necessary material will be provided in classroom notes and handouts on the course website.

**IMPORTANT NOTES:**

- Refer to the course website on a regular basis for updates and deadlines
- All lab and project reports MUST be submitted prior to writing the final exam

**MARKING SCHEME:**

1. Lab Work & Assignments:	20%
2. Project I:	20%
3. Project II:	10%
4. Midterm:	20%
5. Final Exam:	30%

**GRADING SCHEME (COLLEGE POLICY):**

A+	90-100%	B-	70-72%
A	85-89%	C+	65-69%
A-	80-84%	C	60-64%
B+	77-79%	D	50-59%
B	73-76%	F	0-49%



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If you or someone you know requires immediate, urgent, or emergency support (e.g. illness, injury, thoughts of suicide, sexual assault, etc.), **SEEK HELP**. Resource contacts @ <http://camosun.ca/about/mental-health/emergency.html> or <http://camosun.ca/services/sexual-violence/get-support.html#urgent>

### **College Services**

Camosun offers a variety of health and academic support services, including counselling, dental, disability resource centre, help centre, learning skills, sexual violence support & education, library, and writing centre. For more information on each of these services, visit the **STUDENT SERVICES** link on the College website at <http://camosun.ca/>

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Camosun strives to provide clear, transparent, and easily accessible policies that exemplify the college's commitment to life-changing learning. It is the student's responsibility to become familiar with the content of College policies. Policies are available on the College website at <http://camosun.ca/about/policies/>. Education and academic policies include, but are not limited to, Academic Progress, Admission, Course Withdrawals, Standards for Awarding Credentials, Involuntary Health and Safety Leave of Absence, Prior Learning Assessment, Medical/Compassionate